



Biotechnology Clustering Study

Research Paper prepared for the United States Studies Centre

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Executive Summary

Despite the strong reputation of Australian research in medicine, biology, and agriculture, the biotechnology industry in Australia remains modest by global standards. At the United States Studies Centre in the University of Sydney, through a research program funded by the Merck Foundation, we have studied this issue by comparing the biotechnology industry and its supporting ecosystem in Melbourne, Sydney and Brisbane with that of San Diego, California.

San Diego is a pertinent comparator city. Its metropolitan population is scaled roughly halfway between that of Brisbane and Melbourne, and its biotechnology sector has grown rapidly in recent years, generating significantly higher revenues, materially higher R&D spending, and a conspicuously greater asset base than the biotechnology sector across the whole of Australia.

The view that predominates in Australia, as confirmed by a range of participants in Australia's biotechnology sector whom we surveyed, is that we have failed to leverage our research base in biotechnology because of problems in Australia's industrial system. These include the lack of a "flagship" company that can act as a repository of talent when start-ups fail, a lack of access to patient venture capital funding, and a lack of sustained government policy support for biotechnology industry development at both the state and federal levels.

Our analysis, however, suggests a more worrying problem: that Australia's research base is not as outstanding as is popularly imagined. Contrasting the public research base in medical and biological sciences in Brisbane, Melbourne, and Sydney with that in San Diego reveals four fundamental points of difference.

First, Australian cities suffer from a lack of investment intensity. The absolute scale of investment in university research in Australian cities is lower than the equivalent investment in San Diego. More significant, however, is the difference in intensity of

investment, as measured by university research investment per capita. Investment on university R&D per capita in San Diego (~US\$400 per person) is significantly higher than in Brisbane (~US\$300 per person), Melbourne (~US\$250 per person), or Sydney (~US\$200 per person).

Second, Australian cities support a relatively shallow, clinically oriented research portfolio in the life sciences. The scale of investment specifically in medical research (predominantly clinical research) in Australia's largest cities is not far behind the equivalent investment being made in San Diego. In San Diego however, for every research dollar invested in medical sciences, \$1.10 is also invested in the biological sciences. This contrasts starkly with the situation in Australia where, for every research dollar invested in medical sciences, less than 40 cents is invested in the biological sciences. The implication is that the research portfolios of Australian cities are more clinically focused, more applied in orientation, and less likely to generate fundamental breakthroughs than is true in San Diego.

Third, Australian institutions generate research outputs of low average quality compared with San Diego. Over recent years, life scientists in Sydney, Melbourne, and Brisbane have steadily increased the number of articles they publish in scientific journals. Indeed, researchers from each of Melbourne and Sydney now author more papers in life science journals than researchers from San Diego. There is evidence, however, that Australian life scientists are generating volume by publishing in low impact journals and in parochial Australasian journals. As a consequence, while Australia's best research institutes do perform on a par with similar organizations in San Diego, aggregated citations per paper for Australia's leading universities look more like those of San Diego State University than the University of California, San Diego. This raises questions about the quality and global significance of much of Australia's research in the life sciences.

Fourth, Australian institutions appear to generate research outputs of lesser commercial significance. The life science research community in San Diego is much more active in patenting its intellectual property than is true in Australia. Public sector institutions in San Diego make significantly more patent applications based upon their research than do equivalent institutions in any of the Australian cities. Across both the public and private sectors, researchers in San Diego generate more than six times the number of international organic chemistry patents and more than four times as many international medical patents as researchers in any of the Australian cities. These figures imply not just a stronger research base in San Diego, but also a more abundant pool of new ideas available for exploitation by local businesses.

We believe that these fundamental differences should temper near-term expectations about the extent to which Australian public-sector research will generate commercial activity in biotechnology. We also suggest that without first increasing the scale, quality, and the focus of the research base in Australia, it is impossible to establish the extent to which any other purported deficiencies really do represent genuine problems that will impede the development of a biotechnology industry in Australia.

Our assessment suggests that a nascent appetite among some Australian policymakers to try to build higher scale and higher quality research institutes with a molecular rather than a clinical focus (as exemplified by the Institute for Molecular Bioscience at the University of Queensland) has been appropriate. Our analysis also implies, however, that such initiatives can be seen only as a starting point if Australia is to position itself as a serious participant in a future global biotechnology industry.